GRAND PORTAGE BAND OF CHIPPEWA
ENVIRONMENTAL DEPARTMENT
P.O. Box 428, Grand Portage, MN 55605
(218) 475-2026

FOND DU LAC BAND OF LAKE SUPERIOR
CHIPPEWA ENVIRONMENTAL PROGRAM
1720 Big Lake Road, Cloquet, MN 55720
(218) 878-7110

Sent via e-mail only
minnrule7050.pca@state.mn.us

Carol Nankivel
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-419

December 18, 2015

Re: MPCA's March 2015 Proposed Approach for Minnesota's Sulfate Standard to Protect Wild Rice.

Dear Ms. Nankivel:

The Grand Portage and Fond du Lac Bands appreciate this opportunity to comment on MPCA's March 2015 proposed approach for Minnesota's sulfate standard to protect wild rice. As you know, wild rice is a culturally significant resource for the tribes in Minnesota. From historical reports,[1] Band member accounts,[2] and current Minnesota Department of Natural Resources ("DNR") and tribal reports,[3] wild rice has declined significantly throughout Minnesota, and in

[1] Jenks, A.E., The Wild Rice Gatherers of the Upper Great Lakes: A Study in American Primitive Economics (Washington: GPO, 1901), available on-line at http://greatlakeswater.uwex.edu/library/articles-and-white-papers/wild-rice-gatherers-upper-lakes-study-american-primitive-economics (last visited Oct. 12, 2012).
[2] Rosemary Berens, Bois Forte Tribal Historic Preservation Officer
[3] *See, e.g.*, 1854 Treaty Authority website, "Wild Rice Survey" (including list of wild rice waters in the 1854 Ceded Territory), available at http://1854treatyauthority.org/wildrice/survey.htm (last

southern Minnesota wild rice has virtually disappeared. Minnesota tribes have a unique relationship with the state regarding the protection of wild rice, as demonstrated through multiple rulemaking processes[4] and executive orders.[5]

Minnesota tribal staff have participated in and followed closely the MPCA's research program related to the existing sulfate criteria for protecting wild rice waters[6]. Our thorough review and interpretation of the research results for the state-led hydroponics studies, the field surveys, the mesocosm studies, and the sediment studies leads to our conclusion that the existing federally approved sulfate criterion is well-supported by multiple lines of evidence, and should be maintained. As we have concluded in previous comments[7], there is no scientifically defensible basis for changing this sulfate limit, which is the clear benchmark required by the US Environmental Protection Agency for considering approval of a revised criterion[8], and as was clearly communicated to the Minnesota legislative body in 2011[9].

1) Revising the definition/classification of "wild rice waters"

The current state standard for listing wild rice waters is found at Minnesota Rule 7050.0224, "Specific Water Quality Standards for Class 4 Waters of the State: Agriculture and Wildlife," which at Subpart One states:

> The numeric and narrative water quality standards in this part prescribe the qualities or properties of the waters of the state that are necessary for the agriculture and wildlife designated public uses and benefits. Wild rice is an aquatic plant resource found in certain waters within the state. The harvest and use of grains from this plant serve as a food source for wildlife and humans. In recognition of the ecological importance of this resource, and in conjunction with Minnesota Indian tribes, selected wild rice waters have been specifically identified [WR] and listed in part 7050.0470, subpart 1. The quality of these waters and the aquatic habitat necessary to support the propagation and maintenance of wild rice plant species must not be materially impaired or degraded. If the standards in this part are exceeded in waters of the state that have the Class 4 designation, it is considered indicative of a polluted condition which is

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visited Oct. 12, 2012); MN DNR website, "Wild rice management," available at http://www.dnr.state.mn.us/wildlife/shallowlakes/wildrice.html (last visited Oct. 12, 2012).

[4] *See, e.g.,* Minnesota Session Law 2007, Chapter 7, Article 1, Sect. 168

[5] *See, e.g.,* Executive Order 03-05, "Affirming the Government-to-Government Relationship between the State of Minnesota and Indian Tribal Governments Located within the State of Minnesota."

[6] http://www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-rulemaking/minnesotas-sulfate-standard-to-protect-wild-rice.html#assessment

[7] Letter from Minnesota Chippewa Tribe to MPCA re: Definition of "waters used for the production of wild rice"; wild rice water quality standards (February 7, 2014)

[8] *See, generally,* 40 CFR §§ 131.5, 131.11, and 131.21.

[9] Letter from USEPA to Sens. Dill, Bakk, May 13, 2011.

> actually or potentially deleterious, harmful, detrimental, or injurious with respect to the designated uses.

The fundamental Clean Water Act §101(a) 'protection and propagation of fish, shellfish and wildlife' use may also include the protection of aquatic flora. However, the agricultural use class (Minnesota's Class 4 waters) is intended to define *waters that are suitable for the irrigation of crops, consumption by livestock, support of vegetation for range grazing, and other uses in support of farming and ranching and protects livestock and crops from injury due to irrigation and other exposures.*[10] The Minnesota tribes have consistently recommended to the MPCA, during multiple consultation sessions over the past four years specifically focusing on wild rice water quality standards, that natural wild rice stands (manoomin) are more appropriately classified under a distinct aquatic life use (e.g., Minnesota's Class 2 waters). We noted that it may be appropriate to leave paddy rice, a true cultivated agricultural product, in Class 4, but it is inherently offensive to Minnesota tribes to classify manoomin as a 'crop', and we objected to construing the naturally occurring hydrology of a natural wild rice bed as "irrigation". Irrigation is defined as "…to supply (dry land) with water by means of ditches, pipes, or streams"[11]. This is simply not an appropriate or accurate concept for describing a native plant species growing without cultivation in a natural water body.

As part of ongoing consultation between the MPCA and Minnesota tribes, we have learned of the agency's plan to classify natural wild rice waters under a newly-created separate class in Minnesota water quality rules, "Class 8 – Wild Rice Waters". The Bands believe this is an improvement over the existing contorted language (waters used for the production of wild rice), which in recent years has been purposefully misinterpreted with the intent to circumvent regulatory controls,[12] albeit unsuccessfully. But as we have consistently advised the MPCA, water quality protections for manoomin should focus on **preserving and enhancing the sustainability of the resource**, not the anthropocentric construct of 'production.' We still maintain that the appropriate classification for manoomin is in Minnesota's Class 2 waters, with perhaps its own separate subclassification. We believe it should be protected under the relevant Clean Water Act aquatic life use standards, which apply broadly to the physical, chemical and biological attributes necessary to sustain and not degrade aquatic plant and animal species.

2) Density, Acreage thresholds for defining wild rice waters

The tribes have consistently communicated our concerns to the MPCA about applying unwarranted thresholds for wild rice stand density or acreage in determining whether or not a waterbody is a wild rice water. For example, we requested consultation with the agency when it was developing a draft staff recommendation for establishing points of compliance with the existing sulfate standard for the NorthMet proposed mine. We expressed strong concerns for the

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[10] *Id.* at Chapter 2, EPA Water Quality Standards Handbook

[11] Webster's II New College Dictionary (ISBN 0-395-70869-9) 1999. Houghton Mifflin Co.

[12] Minnesota Chamber of Commerce, Appellant, vs. Minnesota Pollution Control Agency, Respondent, WaterLegacy, Defendant Intervenor, Respondent, Dec. 17, 2012, at http://mn.gov/web/prod/static/lawlib/live/archive/ctapun/1212/opa120950-121712.pdf

agency's apparent intention to exclude waters for which tribes had provided evidence of historic harvest; this exclusion of protection for known wild rice waters has been carried throughout the entirety of the NorthMet environmental review process. As a result, wild rice waters that have been degraded by existing mine features will be excluded from water quality standards protection. This scenario will recur in numerous other already-degraded wild rice waterbodies if the MPCA's proposed approach is enacted, and this course of action is not acceptable or approvable under the Clean Water Act.

"Wild Rice Water" means a surface water of the state that contains a self-perpetuating population of wild rice plants, either currently present or that have been present in the given water body since November 28, 1975. The self-perpetuating wild rice population must be represented by a minimum of 8,000 wild rice stems over the surface of a lake, wetland, or reservoir water body or a minimum of 800 wild rice stems over a river-mile reach for a riverine water body. Waters designated as wild rice waters are specifically listed as such in Minn. R. 7050.0470 and are identified with the symbol [WR] preceding the name of the water body.

To provide some context to the proposed definition of wild rice waters, 8,000 stems in a lake roughly equate to 2 stems per square meter over one acre (see Figure 15). Seed from 8,000 stems theoretically has the potential to feed approximately 12 ducks during a one week migratory stop.[13]

This incongruous rationale is based upon protecting 12 ducks during a one week migratory stop, but there is no supporting evidence that demonstrates it would be protective of wild rice waters. A relevant analogy might be if the MPCA considered the question "how many trout does a merganser duck eat?" in its rationale for designating trout lakes and streams, and basing their decision upon the number of merganser ducks a waterbody can support for a week of feeding. In fact, MPCA protects trout streams based upon the thermal and habitat potential that a lake or stream could support trout. Further, a trout lake or stream is not protected based on the number of trout that have been shocked in that waterbody on any given year. In fact, the MPCA St. Louis River Stressor ID report[14] concludes for Wyman Creek, a designated trout stream that has been assessed as impaired for its fish community: "Based on the historical presence of brook trout, Wyman Creek remains a designated trout stream, despite a lack of trout in the more recent monitoring efforts." The MPCA should consistently apply this justification for protecting brook trout *and* manoomin.

Previously, tribal staff have also elevated the importance of distinguishing between a "designated use" and an "existing use" in consultation with the MPCA. An "existing use" can be demonstrated by either a) fishing/swimming has actually occurred since November 28, 1975, or b) that the water quality is suitable to allow the use to be attained--unless there are physical problems, such as substrate or flow, that prevent the use from being attained.[15] Following, "No activity is allowable under the antidegradation policy which would partially or completely

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[13] MPCA at https://www.pca.state.mn.us/water/draft-proposal-protecting-wild-rice-excess-sulfate , Detailed MPCA proposal for protecting wild rice from excess sulfate.
[14] SLR_SID_FINAL DRAFT_5_26_15.pdf
[15] *See* Chapter 4, Water Quality Standards Handbook, Protection of Existing Uses

eliminate any existing use *whether or not that use is designated in a State's water quality standards*. The aquatic protection use is a broad category requiring further explanation. *Non-aberrational resident species must be protected, even if not prevalent in number or importance.* Water quality should be such that it results in no mortality and no significant growth or reproductive impairment of resident species. Any lowering of water quality below this full level of protection is not allowed. A use attainability analysis or other scientific assessment should be used to determine whether the aquatic life population is in fact an artifact or is a stable population requiring water quality protection."[16]

Designated uses may be changed *only* based upon findings of a use attainability analysis that has demonstrated that attaining the designated use is not possible because of naturally occurring pollutant concentrations, natural flow conditions, hydrologic modifications, substantial widespread economic impact resulting from more stringent controls, or human-caused pollution that cannot be remedied. A designated use cannot be removed if the use can be attained by implementing effluent limits and best management practices.[17] Therefore, attainable uses are, at a minimum, the uses (based on the State's system of water use classification) that can be achieved: (1) when effluent limits under sections 301 (b)(l)(A) and (B) and section 306 of the Act are imposed on point source dischargers; and (2) when cost-effective and reasonable best management practices are imposed on nonpoint source dischargers.

MPCA considered acreage, density and the importance of wild rice to humans and waterfowl when developing the proposed approach to identifying and listing specific Minnesota water bodies as wild rice waters. The sources of wild rice information considered included wild rice harvester and field survey databases and responses to a 2013 formal call-for-data completed by MPCA...MPCA also intends to replace the existing rule language of "water used for the production of wild rice" with "wild rice waters" as the term describing the beneficial use that the standard is intended to protect."[18]

The information sources that MPCA used to develop their draft list of wild rice waters included the inventory of wild rice water body locations identified in the Minnesota Department of Natural Resources (MDNR) 2008 report to the state legislature.[19] The objective of that effort was "to consolidate and update existing natural wild rice information and produce an inventory of those waters." The inventory was developed with substantial input from state, federal and tribal representatives, and although it is considered "the most comprehensive list available, it does under-represent rivers, streams and ditches with wild rice and a large number of listed waters do

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[16] *Id.*

[17] Per 40 C.F.R. Section 131.10(d), "[w]hen designating uses, States may wish to designate only the uses that are attainable. However, if the State does not designate the uses specified in section 101(a)(2) of the Act, the State must perform a use attainability analysis under section 131.10(j) of the regulation. States are encouraged to designate uses that the State believes can be attained in the future."

[18] MPCA at https://www.pca.state.mn.us/sites/default/files/wq-s6-43n.pdf, Information Sources Used to Develop the Draft List of MPCA Wild Rice Waters.

[19] Natural Wild Rice in Minnesota – A Wild Rice Study document submitted to the Minnesota Legislature by the Minnesota Department of Natural Resources, February 15, 2008.

not contain wild rice acreage estimates." (Id.) MPCA excluded waters from this report that did not include estimates of greater than 2 acres of wild rice, unless another resource reference corroborated that water body was a 'wild rice water'. In doing so, MPCA in effect 'delisted' Minnesota wild rice waters with an existing use. The MPCA asserts that "Generally, the wild rice information from these resources was originally gathered to serve a specific program interest and was not intended for regulatory use."

However, the purpose of the MDNR effort was not only to create the inventory and identify potential threats to wild rice, but also to make "recommendations to the legislative committees *with jurisdiction over natural resources on protecting and increasing natural wild rice stands in the state* (emphasis added)." Recommendation 5 directed the MDNR to convene a standing interagency wild rice workgroup to share information and develop recommendations for inventory methodology and trend assessments, education and information outreach, lake planning and management, harvester recruitment and retention, and other management issues as they arise. The rationale for that charge was that "Comprehensive protection and management of wild rice involved multiple agencies. Management needs include **better inventory information** (emphasis added) including consistent methodology for trend analysis, documenting natural genetic diversity, and establishing long-term case studies on identified lakes."

It is reasonable to interpret the MDNR list as 'intended for regulatory use'. And since 2008, there have been periodic updates to that list, as intended. It is **not** reasonable, or consistent with the Clean Water Act, to 'winnow' the MDNR list according to some arbitrary minimum acreage, which has no ecological relevance. Further, the fact that the state has neglected to collect sufficient data over the past four decades to support *either* their arbitrary acreage threshold or the existing water quality standards to protect this specific beneficial use have been in place, is not in and of itself justification for the de facto delisting of hundreds of inventoried wild rice waters.

Minnesota's existing WQS require that the quality of listed and unlisted wild rice waters, and the aquatic habitat necessary to support the propagation and maintenance of wild rice plant species, not be materially impaired or degraded. In other words, Minnesota already requires the listing of *all* wild rice waters, regardless of production—the rules make no distinction based upon productivity.[20] As noted, most of the waters that now appear on MPCA, DNR, and the 1854 Treaty Authority lists *already* have an "existing use" as "waters used for the production of wild rice," whether or not they include an estimate of acres of wild rice present for any given year. These waters must remain on the wild rice waters lists for regulatory purposes. They cannot be excluded from any future revised list, in effect, de-listing them as 'wild rice waters of the state' with the stroke of a pen. The Clean Water Act clearly states that removing a designated use can only happen after significant process, including a reasoned determination has been made that production of wild rice is a designated use, not an existing use, and based upon the findings of a use attainability analysis, that the designation of "waters used for the production of wild rice" should be eliminated.

As we have communicated to the MPCA, equally disturbing to us is the proposed creation of a "watch list" for more than 900 additional water bodies which, as explained in the spreadsheet

[20] *See* Minn. R. 7050.0224 subp. 1.

header, will "require additional wild rice surveys to determine if the waterbody meets the minimum wild rice stem count threshold."[21] These are waterbodies identified by the MDNR from 2008 through 2013 as part of their ongoing process for updating the state inventory of wild rice waters. It is not justifiable to exclude these waterbodies from the list of wild rice waters protected under Minnesota water quality standards.

If a *designated use* is an *existing use* (as defined in 40 CFR 131.3) for a particular water body, the existing use **cannot be removed** unless a use requiring more stringent criteria is added. However, uses requiring more stringent criteria may **always be added** because doing so reflects the goal of further improvement of water quality. This is entirely consistent with the intent of not only the Clean Water Act goals, but also the intent of the DNR and Tribes in continually updating the list of wild rice waters within the state.

The Bands completely refute the application of a density threshold for determining whether or not to list a waterbody as a wild rice water; our arguments have been clearly articulated through several years of ongoing consultation. A minimum stem density threshold is not appropriate or protective of the *sustainability* of the resource, given the profound loss of resource that has already occurred throughout the state and across its historic range. It does not take into account the need to preserve genetic diversity, nor does it recognize the inherent year-to-year variability of even healthy, vigorous, productive wild rice stands that may be experiencing a "bust" season during a random monitoring event. The state does not yet have sufficient data, it argues, to designate certain wild rice waters or to assess *any* wild rice waters as impaired. In the future, **given sufficient data** (across time and spatially), an index of condition could be developed for assessment purposes. But at this time, the agency does not have sufficient data to assess whether sparse stands are indicative of natural seasonal variability or population decline. This is yet another argument for the need to broadly protect wild rice habitat (and significantly expand its monitoring program), not rely upon some arbitrary density threshold to determine whether a waterbody is a wild rice water.

3) Interpretation of research results

The Bands acknowledge and support MPCA's reliance on multiple lines of evidence for considering rule revisions: field surveys, laboratory hydroponic experiments, mesocosm experiments, supplemented by rooting zone profiles that characterize sulfate, sulfide and iron in both field sites and mesocosms, and the sediment incubation experiments that challenge the presumption that seasonal application of a sulfate criterion is protective. This approach for reviewing and revising water quality standards and criteria is substantially more robust and defensible than simply using short term hydroponics experiments.

The MPCA proposal (p. 2) summarizes what the agency has learned through the multi-pronged research program and subsequent analysis:

- Wild rice is vulnerable to elevated sulfate concentrations because sulfate can be converted to sulfide by bacteria in the sediment where wild rice is rooted. Sulfide's

[21] MPCA draft watch list of Wild Rice waters (Oct. 26, 2015)

toxicity to animals and plants, including wild rice, varies with its concentration (justification for continuing to use a sulfate criterion as the indirect measure; easier to measure in situ than sulfide)

- The protective threshold of sulfide in porewater is 0.165 mg/l; the likelihood of wild rice being present in a lake or stream declines as sediment porewater sulfide levels increase above that concentration (depends upon what you consider "protective")
- Data from the mesocosm studies demonstrate that as sulfate concentration in surface water increase, the sulfide concentration in the sediment also increase (multiple lines of evidence)
- In Minnesota lakes and streams, the efficiency of this conversion of sulfate to sulfide is highly variable due to environmental differences. The most important of these differences are the concentrations of iron and organic carbon in the sediment. (Schimpf, 2015)
- Elevated sulfate has the potential to negatively impact wild rice. However, no single concentration of sulfate is protective of wild rice in all water bodies; sulfate is converted to sulfide at a different efficiency in each water body, depending on iron and total organic carbon concentrations in the sediment. (see variability; MPCA does not and will not ever have sufficient data to rely upon a site-specific determination)
- The different efficiency of sulfate conversion among water bodies can be characterized by an equation. The equation can then be used to calculate a protective sulfate concentration for a water body that will still allow the wild rice population to self-perpetuate over the long term (THIS HAS NOT BEEN EXPLICITLY PROVEN!!! See Twin Lakes)
- The equation is founded in a model that considers the variability in sediment iron and total organic carbon levels among wild rice water bodies. The inputs for the equation are the concentrations of iron and organic carbon in sediment (Equation 1).

However, we do not agree with the state's proposed approach (using an equation to derive site-specific 'protective values' for sulfate). We believe the state's multi-pronged research program actually affirmed the protectiveness of the existing 10 mg/l sulfate criterion, and negated the application of any seasonal exemption for sulfate loadings to wild rice waters. It appears that the MPCA also believed that to be the case, until undue political pressure was brought to bear, and the agency unexpectedly delayed the release of their preliminary interpretation of their research findings, ultimately releasing a substantially modified interpretation.

4) Protectiveness of the proposed site-specific equation; appropriateness of approach

Equation-based approaches for identifying a protective value of a chemical have been incorporated into water quality standards for other chemicals of concern, including ammonia and some metals. A general process to calculate the protective sulfate threshold is shown in Figure 1. (page 3, March 2015 Proposed Approach)

MPCA provides a flowchart describing their process for calculating a 'protective sulfate threshold':

- **Obtain data** (collect/compile sediment iron, sediment organic carbon data from wild rice stands);
- **Calculate** (enter iron and carbon data into Equation 1 to produce a calculated protective concentration (CPSC) from each sediment sample);

- **Determine Protective Sulfate Value** (follow guidance to translate CPSCs into the protective sulfate value (PSV) for the wild rice waters.

"SEM evaluates complex hypotheses of multivariate relationships that can be statistically compared to field data (Gough and Grace 1999)."[22] *Evaluating* hypotheses is very different from using what is considered the most likely hypotheses *to create water quality standards without additional testing of the hypotheses*. The formula is an overreach of what SEM is intended and able to do.

The Bands refer MPCA to the comments of Bill Shipley (November 4, 2015), submitted to the agency by WaterLegacy,[23] as expert opinion on the use of SEM as a predictive model. Dr. Shipley noted the poor predictive ability of the SEM-derived equation, and the lack of confidence intervals for observed porewater sulfide concentrations. He concluded that the equation could not reliably distinguish between lakes whose porewater sulfide concentrations were above or below the critical value. Questions remain regarding the underlying causal processes related to the predictor variables, and the lack of experimental evidence confirming those processes is a critical deficiency.

The appropriateness of the SEM approach is a different issue than the determination of a protective sulfide criterion/sulfate translator. In the MPCA proposal (P. 5), a logistic dose-response curve is used to derive the concentration associated with a particular level of negative effect on an organism. Effect $concentration_{percent}$ values can be derived; MPCA has proposed using the EC_{10} sulfide values (concentration estimated to reduce the response, i.e., growth, survival, reproduction, presence by 10% relative to the control). We question, in this instance, what the relevant 'control' population is; this question pertains to our basic rejection of the MPCA's proposal for using density or acreage thresholds for the definition of a wild rice water. Wild rice stands that have already been diminished will not be protected sufficiently from further degradation.

Field survey data best characterize the conditions under which wild rice populations are self-perpetuating over many generations, but at this time MPCA does not have sufficient data to show that any wild rice water body is self-perpetuating. To be more conservative (i.e., protective) a lower EC value should be used; we agree with the Scientific Peer Review team recommendation that an EC_5 be considered. A relevant example is the field-based benchmark conductivity standard that EPA developed for the Appalachian coal mining region; that Scientific Advisory Board-approved process used an 'extirpation coefficient' of 5, in order to protect aquatic communities from degradation as compared to reference streams. This EC_5 represented an aquatic life endpoint concentration of a contaminant (in this case, conductivity) above which 5% of the expected native macroinvertebrate taxa were 'missing' or extirpated from the waterbody. Research confirmed that substantial aquatic life effects have already occurred when conductivity

[22] MPCA Proposal for sulfate wild rice standards, p. 11, Mar. 24, 2015.
[23] Evaluation of the structural equations model described in the document entitled "March 2015 proposed approach for Minnesota's sulfate standard to protect wild rice" by the Minnesota Pollution Control Agency, dated March 24, 2015

levels reached 500 µS/cm,[24] so the benchmark was set at 300 µS/cm, which was generally protective of biological condition.

In MPCA's field surveys, biological response measured was density of wild rice at a sediment measurement site; the dose variable was the concentration of sulfide in the sediment porewater at the site. For logistic curve fitting, the response variable was presence/absence of wild rice at sites, with **presence defined as at least 2 stems per square meter**. The EC_{10} for the field survey is the porewater sulfide concentration at which there is a 10% reduction in the probability that wild rice would be observed at any given site. The EC_{10} derived from field survey data is 165 µg/l, which MPCA proposes as the porewater sulfide concentration that is *protective of growth and reproduction for wild rice populations.* This is the problem inherent in the MPCA's conflation of stem density as both the definition of a wild rice water, and essentially an assessment endpoint; they are not equivalent, and the MPCA does not have the data to explicitly support their assumption that this concentration is indeed protective of growth and reproduction at the population level.

Probability of presence is not equal to sustainable growth. The 2 stems/m^2 definition allows for substantially reduced wild rice densities to still be considered healthy and sustainable. Wild rice stands that have been diminished from their historic, healthy, sustainable condition will not be 'recognized' as impaired. As GLIFWC staff have communicated to the MPCA in consultation, we should not assume that a logistic curve is the appropriate fit; there can be substantial adverse population effects at very low sulfide concentrations.

If MPCA were to explore using a much higher impact criteria (i.e., 50 stems/sq.meter), the newly-derived EC_{10} would more likely suggest that beds with moderately reduced densities would be considered impacted.

Ultimately, the Bands caution that the stem density at which rice is considered impacted should be a different issue than the stem density used for defining a wild rice water.

The MPCA's proposed approach (P. 7) has estimates of effect concentration described individually for the mesocosm, hydroponic, and field study components because each are unique in their measured responses. Figure 4 shows estimated EC_{10} values for each of the three study components plotted in comparison to the 165 µg/l sulfide concentration. While they are quantifying different biological responses and therefore show different results, all the results are relevant to wild rice. It is notable that all of the EC_{10} values are of similar magnitude (Table 2). The field survey EC_{10} value is relied upon for the MPCA proposal because it best represents the full lifecycle of wild rice.

However, the field data on rice density and rice percent cover indicate that sulfide concentrations less than 165 ug/L have adverse impacts on rice. Again, tribal staff have argued, and provided supporting technical documentation, that MPCA's position that rice is protected if sulfide is kept

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[24] Pond, G.J., M.E. Passmore, F.A. Borsuk, L. Reynolds, and C.J. Rose. 2008. *Downstream Effects of Mountaintop Coal Mining: Comparing Biological Condition Using Family- and Genus-Level Macroinvertebrate Bioassessment Tools.* J. N. Am. Benthol. Soc. 27(3):717-737.

below 165 ug/L is unjustified. Table 2 (p. 9) demonstrates that a more conservative approach is warranted. Log transformed biological endpoints from the mesocosms (number of plants germinated, percent filled seeds), and both the time-weighted arithmetic and geometric hydroponic growth means suggest that a sulfide concentration *lower than 165 micrograms/liter* is necessary to be protective.

Iron as a mitigating constituent for sulfide toxicity

The MPCA proposed approach assumes iron is infinitely available (P. 9, 10): "As sulfide is produced from sulfate, if iron is available in the sediment it can interact with the sulfide and form a solid that does not affect wild rice." However, based upon the results Dr. Pastor and Dr. Johnson's ongoing work, which the Bands have supported, there is no evidence that iron is "protective" of wild rice, and that in fact it forms a hard iron sulfide precipitate on wild rice roots. This coating potentially inhibits nutrient uptake, especially at critical points in the life cycle; the cumulative effects are apparent in year-to-year treatment responses.

Another reasonable way to interpret Figure 6 is to consider that interaction with sulfide over time consumes available iron. MPCA does not have sufficient experimental or field data to assume sufficient replenishment of iron to counteract sulfate loadings.

5) Implementation of proposed site-specific equation

From the proposed approach (p. 15), "If sediment organic carbon and sediment iron data are available from a wild rice site, the protective concentration of surface water sulfate can be calculated. Given that the field data show that iron and total organic carbon vary among sites and are independent of each other, calculating the protective level of sulfate based on these variables is a more appropriate approach to protecting wild rice from the impacts of elevated sulfate than relying upon a single sulfate concentration as a protective threshold for all sites. Unfortunately this variability is also high *within* sites; we disagree with the MPCA's interpretation (p. 19) in Figure 14: "It is clear that there is variability within wild rice waters, but the difference *between* waters is much greater than the variability *within* a specific wild rice water. The use of the log-log scale has the effect of contracting the clusters; observe the spread between 'CPSCs' for an individual water body and it is clear to the Bands that there is significant variability within a waterbody. This factor will make it difficult, if not impossible, to calculate a single protective sulfate value for a given waterbody, and more importantly, renders criteria endlessly challengeable.

It is unclear if the MPCA will be able to determine an acceptable (from the perspective of a permittee), protective sulfate level given the high variability in that data. Applying the proposed equation to data collected at the Twin Lakes (near the US Steel Minntac tailings basin), an obvious location for immediate application of the standard, generates "protective" sulfate levels that range from 28 ppm to 96 ppm. First, the wild rice has been decimated by 40 years of uncontrolled sulfate loading, so the remaining sparse plants would not even meet the MPCA's proposed density or coverage threshold to be considered a wild rice water. Second, given this variability of calculated "protective" sulfate concentrations within a single lake, the Bands are justifiably concerned that no permit limits would, or could ever be implemented.

MPCA acknowledges (p. 17) that "An appropriate level of protection requires sediment sampling and analysis." However, the approach totally ignores the need to integrate the sediment and water chemistry data with robust, standardized field methods for measuring the important biological response: wild rice productivity, sustained over time. Otherwise the MPCA's approach will fall far short of the goal of protecting sustainable populations of wild rice across the state, where it still persists. The Bands continue to advocate for the state to adopt the recently published field methods manual, so that all agencies in this region where wild rice still survives can be monitoring this resource in a comparable way.[25]

The data collected to use in the structural equation model (SEM) to develop site specific criteria has shown the concentration of sulfate, iron, and organic carbon within a single water body varies considerably.[26] MPCA hasn't yet determined how many water column, pore water, and sediment samples must be collected from each site; if the median, lowest or highest concentrations of each parameter should be used in the formula; how often receiving waters would need to be resampled to ensure that seasonal and annual variations of each constituent are accurately depicted in the formula.[27] Still missing from the approach is a regulatory framework by which dischargers would be required to monitor wild rice stands to determine if the SEM equation for a particular water body was in fact meeting the standards set.

These are all serious considerations because, as noted by MPCA, there is relatively high variability of each of the parameters in a single water body. Therefore, the burden to your agency to implement this standard is great. For impaired wild rice waters, waste load allocations and TMDL development and implementation would also require considerable staff resources and time. At a point in time when MPCA maintains that it doesn't have enough staff to adequately write or update NPDES permits, it seems unlikely there would be adequate staff to responsibly implement this proposed approach either.
Furthermore, the Minnesota tribes with authorized water quality standards would *not* move to a less-inclusive definition or less-protective criterion even if the state adopted it. Minnesota's wild rice waters, whether designated by the state or not, are also federally protected as tribal traditional cultural properties under Section 106 of the National Historic Preservation Act (NHPA).[28] The NHPA requires not only that a project with the potential to impact traditional cultural properties must carefully analyze potential impacts, but also stipulates that appropriate mitigation must be done or a project cannot proceed.

We also urge MPCA expedite the listing of "impaired" wild rice waters in order to ensure that water-quality-based effluent limits can be applied to discharges that exceed WQS criteria - just as Minnesota Rules already mandate. Any water body that is currently listed by the DNR, 1854 Treaty Authority, or MPCA as a wild rice water body, and is known to exceed Minnesota sulfate WQS for wild rice, should be designated as "impaired."[29] This would be consistent with the

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[25] Kjerland, T., 2015, Wild Rice Monitoring Field Guide. The University of Minnesota Sea Grant Program, Publication #SH15.ISBN 978-0-9965959-0-2.
[26] *Id.*, at p. 19, figure 14, Mar. 24, 2015.
[27] *Id.* at p. 20.
[28] *See* 36 C.F.R. §§ 800 *et seq.*
[29] *See* Minn. R. 7050.0224 subp. 1.

MPCA's approach to designating any other type of impairment with assigned numeric or narrative criteria.

Conclusion

Natural stands of wild rice (manoomin) should be protected as a distinct Class 2 aquatic life use in Minnesota WQS, and the existing sulfate criteria (10 mg/l) should be maintained for this use class, unless sufficient data exists to calculate a protective site-specific criterion on a case-by-case basis as provided under the CWA. Narrowly defining waters used for the production of wild rice, based upon an arbitrary measure of waterfowl usage, is inconsistent with Clean Water Act requirements. Creating a "watch list" to determine if waters already known as "wild rice waters," and listed by on the MN DNR, MPCA, or 1854 Treaty Authority, but that do not have estimated acreages, is also inconsistent with the Act. In order to protect and restore wild rice waters, natural variability in stand density and annual changes in location of stands in both streams and lakes must be acknowledged. The legislative mandate to consider wild rice acreage and stand density is most appropriately dealt with as an integral part of the MPCA's water body monitoring and assessment programs, not as a component of the water quality standard definition. Consideration of a more protective value, such as an EC_5, is warranted given the fact that manoomin is such a culturally and ecologically important resource and has already experienced widespread diminishment across its natural range. Sustaining this resource requires an exceptionally conservative approach.

The goal should be continuing to build an inventory of natural wild rice waters that facilitates both conservation and monitoring, and that will dovetail with other procedures the MPCA is already implementing to require dischargers to do improved quality-assured monitoring. And properly listing impaired wild rice waters will ensure that water quality based effluent limits can be applied to dischargers that exceed Minnesota WQS criteria for the protection of these waters.

Sincerely,

Nancy Schuldt
Fond du Lac Water Projects Coordinator

Margaret Watkins
Grand Portage Water Quality Specialist

Cc. Patricia Engelking, MPCA
Katrina Kessler, MPCA
Shannon Lotthammer, MPCA
Susan Hedman, US EPA
Tinka Hyde, US EPA
Linda Holst, US EPA
Katharine Marko, US EPA